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09/852,028	05/10/2001	Surender V. Brahmaroutu	219.39661X00	4632

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EXAMINER

PHAN, TAM T

ART UNIT

PAPER NUMBER

2144

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/852,028

Applicant(s)

BRAHMAROUTU, SURENDER V.

Examiner

Tam (Jenny) Phan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☒ Claim(s) 1, 11, 19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. This application has been examined. Claims 1-25 are presented for examination.

#### ***Priority***

2. No priority claims have been made.
3. The effective filing date for the subject matter defined in the pending claims in this application is 05/10/2001.

#### ***Claim Objections***

4. Claims 1, 11, and 19 are objected to because of the following informalities: "creating an all switch shortest paths table which records all the shortest paths between every switch pair on the subnet based the port-to-port connectivity information" should read "creating an all switch shortest paths table which records all the shortest paths between every switch pair on the subnet based on the port-to-port connectivity information."
5. Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shah et al. (U.S. Patent Number 6,694,361), hereinafter referred to as Shah, in view of Cheng (U.S. Patent Number 6,563,798).

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8. Regarding claim 1, Shah disclosed a method for programming forwarding tables for switches for multipathing in a subnet of a switched fabric including at least a host system, a target system and switches each having one or more ports interconnected via links, said method comprising: determining all possible links between all ports on the subnet during topology discovery (Figure 8, column 8 lines 42-67, column 9 lines 18-21), creating an all port connectivity table which records all port-to-port connectivity information (Figure 8, column 8 lines 42-67, column 4 lines column 4 lines 22-27); and computing forwarding tables for respective switches on the subnet that allow usage of multiple paths between switch pairs based on the port-to-port connectivity information (Figure 8, column 7 lines 27-42, column 12 lines 19-28).

9. Shah taught the invention substantially as claimed. However, Shah did not expressly teach the steps of creating an all switch shortest paths table which records all the shortest paths between every switch pair on the subnet based the port-to-port connectivity information and computing forwarding tables for respective switches on the subnet that allow usage of multiple paths based on the shortest paths between every switch pair.

10. Shah suggested exploration of art and/or provided a reason to modify the method for programming forwarding tables with the shortest paths feature (column 7 lines 29-34, column 9 lines 1-7, column 12 lines 10-13).

11. Chen disclosed a method for creating an all switch shortest paths table which records all the shortest paths between every switch pair on the subnet based the port-to-port connectivity information and computing forwarding tables for respective switches on the subnet that allow

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usage of multiple paths based on the shortest paths between every switch pair (Figures 2-3, column 43-55, column 4 lines 15-25, column 5 lines 42-47).

12. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the method of Shah with the teachings of Chen to include the shortest paths feature in order to optimized designated traffic (Chen, column 3 lines 39-42) since shortest path table is constructed based on the optimization traffic metric (Chen, column 3 lines 26-32).

13. Regarding claim 2, Chen disclosed a method further comprising: downloading the forwarding tables to respective switches on the subnet that allow usage of multiple paths between switch pairs; and enabling respective switches on the subnet to route data packets from the host system to the target system via multiple paths through the switched fabric (column 3 line 56-column 4 line 4).

14. Regarding claim 3, Shah disclosed a method wherein each of said host system and said target system includes a channel adapter (CA) installed supporting one or more ports with each port having multiple local identifiers (LIDs) assigned thereto for multipathing (Figure 2, column 8 lines 42-51).

15. Regarding claim 4, Shah disclosed a method wherein each port on the subnet supports a unique 16-bit LID and a LID Mask Control (LMC) which specifies the number of low order bits of the LID to mask when checking a received destination LID against the port's destination LID (column 2 lines 48-55, column 8 lines 42-51). LID features and LMC are well known in the InfiniBand network environment.

16. Regarding claim 5, Shah and Chen disclosed a method wherein said forwarding tables are computed to ensure loop-less paths and allow ports to be addressed by multiple local identifiers

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(LIDs), and wherein said all-port connectivity and all-switch shortest paths tables are constantly updated reflecting any dynamic changes to the subnet topology (Shah, column 8 lines 37-41, column 12 lines 56-57; Chen, column 6 lines 17-26).

17. Regarding claim 6, Chen disclosed a method wherein said forwarding tables are computed based on the principle that only the shortest path between a given switch pair is guaranteed to overlap with other shortest paths that either originate from or destined to some intermediate port that exists on the shortest path between the original switch pair (column 3 lines 15-27, column 6 lines 6-16, column 9 lines 19-32).

18. Regarding claim 7, Shah disclosed a method wherein a forwarding table for a switch is computed by: determining a destination switch to which a destination port is directly connected, identifying all the links that exist between the destination switch and other switches in the subnet; sorting all the links by respective originating port number in an ascending order; picking an appropriate link and identifying the switch to which the link is connected at the other end; determining the best route between the switch identified and the switch for which the forwarding table is being constructed; and inputting associated output number at a designated location in the forwarding table (column 8 line 42-column 9 line 12, column 10 lines 27-39).

19. Regarding claim 8, Chen disclosed a method wherein said shortest paths between every switch pair are computed utilizing an All Pair Shortest Paths (APSP) algorithm, and each shortest path from the source to the destination switch is represented by a <Port, Cost> duple in which port is the port number of the source switch where the path originates and cost is the path cost metric that is computed based on a hop count, a message transfer (MTU) size, a link speed,

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width and other port and link characteristics (column 3 line 60-column 4 line 4, column 4 lines 15-27, column 10 lines 11-23, lines 51-62).

20. Regarding claim 9, Shah disclosed a method wherein a forwarding table for a switch is computed by: determining a destination switch to which a destination port is directly connected, identifying all the links that exist between the destination switch and other switches in the subnet; sorting all the links by respective originating port number in an ascending order; picking an appropriate link and identifying the switch to which the link is connected at the other end; determining the best route between the switch identified and the switch for which the forwarding table is being constructed; and inputting associated output number at a designated location in the forwarding table (column 8 line 42-column 9 line 12, column 10 lines 27-39).

21. Regarding claim 10, the claim is depended upon a rejected claim, therefore, is also rejected.

22. Regarding claims 11-18, the data network corresponds to the method of claims 1-8 and 10, and thus these claims are rejected using the same rationale.

23. Regarding claims 19-25, the data network corresponds to the method of claims 1-2 and 4-8, and thus these claims are rejected using the same rationale.

24. Since all the limitations of the claimed invention were disclosed by the combination of Shah and Chen, claims 1-25 are rejected.

### ***Conclusion***

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Papoushodo et al. (WO 003056758 A1) titled "Technique Of Determining Connectivity Solutions For Network Elements" disclosed a technique of finding connectivity solutions for network elements to be switched into a path selected in a network managed by a network management system (NMS), wherein each network element comprises input ports and output ports, each of the ports enabling a plurality of connection points, the technique including providing, at the level of NMS, a connectivity table (CT) comprising data on possible internal connections between connection points of any input port and any output port of any of the network elements managed by the NMS. The technique enables, whenever a particular network element is selected with its input port and its output port to be used in the path, obtaining a connectivity solution for the particular network element at the level of NMS.
- b. Ayandeh (U.S. Patent Number 6,069,895) disclosed a design for a network route server in which network routing functions are distributed throughout the processing elements that constitute a switching node, while maintaining the global identity and routing information exchange functions of a route server element (RSE). The RSE serves the functions of network topology discovery and routing table construction using a network topology database and an optimal routing algorithm. Copies of the dynamically maintained routing tables are distributed to the intelligent line-cards on a periodic basis governed by predetermined criteria. The advantage is a significant increase in switching capacity as well as an increased degree of network connectivity.
- c. Hummel (U.S. Patent Number 6,333,918) titled "Method of forming routing data" disclosed switching nodes of a communications network are assigned sub-networks and

are interconnected to one another in any desired fashion. Stored in a source switching node is at least topology information on the node's own sub-network and on the interconnection of the sub-networks. By reference to the topology information, a subset of switching nodes and connecting lines, which satisfies the communications conditions, is selected and a route to the destination-switching node is determined. Included in this process is a route which, in the direction from the source-switching node to the destination-switching node, leaves at least one sub-network once and returns to the sub-network again in the further course of the route. The routing information is then formed from the route, which has been determined.

26. Refer to the enclosed PTO-892 for details and complete listing of other pertinent prior art of record.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tam (Jenny) Phan whose telephone number is (571) 272-3930. The examiner can normally be reached on M-F 9:00-5:00.

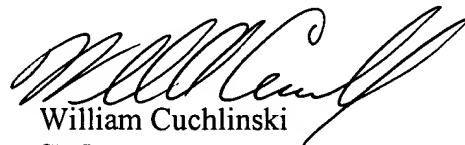
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Cuchlinski can be reached on (571) 272-3925. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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November 24, 2004